

The set of chosen hazard indicators is

$$\mathcal{H} = \{h_i : i = 1, \dots, n_H\} \quad (1)$$

with  $n_H$  number of hazard drivers from the European Taxonomy. Each element is a function of climate variables

$$\forall i \in \{1, \dots, n_H\} \quad h_i : \mathcal{C} \rightarrow \mathbb{R} \quad (2)$$

where  $\mathcal{C}$  is the set of climate variables.

The set of indicators built by the interaction from existent hazard drivers is

$$\{h_{n_H+i} : i = 1, \dots, n_{X_j}\} \quad (3)$$

with  $n_{X_j}$  number of additional hazard drivers considered in the  $j$ -th experiment. This number might change in each experiment for category 2 complex risks.

The set of assets characterising the system is

$$\mathcal{A} = \{a_i : i = 1, \dots, n_A\} \quad (4)$$

with  $n_A$  as the number of assets. This number is fixed as the outcome of the vulnerability and exposure analysis steps.

Considering experiments for category 1 complex risks, the resulting *hazard matrix*, i.e. the matrix containing values of hazard indicators for each asset, is  $H \in \mathbb{R}^{n_A \times n_H}$

$$H = \begin{bmatrix} h_{1,1} & \cdots & h_{1,n_H} \\ \vdots & \ddots & \vdots \\ h_{n_A,1} & \cdots & h_{n_A,n_H} \end{bmatrix} \quad (5)$$

Once a particular choice of indicators is made, values of this matrix change when different datasets are considered.

When category 2 complex risks are considered, the hazard matrix is extended adding new columns corresponding to indicators which model complex interactions between hazard drivers. The new indicators are collected in a matrix  $H_{X_j} \in \mathbb{R}^{n_A \times n_{X_j}}$ . Using block notation the extended matrix becomes  $[H|H_{X_j}]$  for the  $j$ -th experiment and all the analysis performed on category 1 complex risks are extended directly to this matrix since they operate only on the rows.